International Centre for Research in Organic Food Systems

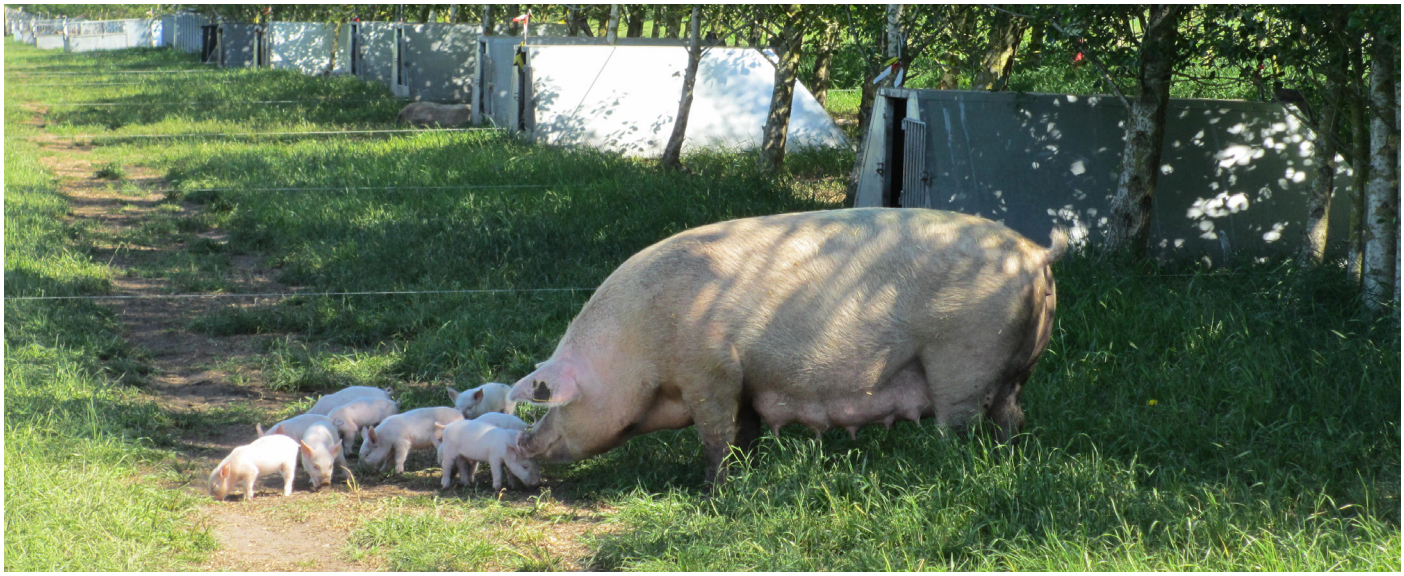
Research and Development Strategy 2023

for

For Organic Agriculture and Food Systems

ICROFS

International Centre for Research in Organic Food Systems



Research and Development Strategy 2023
For Organic Agriculture and Food Systems

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Cover page: Helene Uller-Kristensen, ICROFS and Organic RDD-projects ENTRANCE, ProLocAL & OatGanic
Photo p. 2: Organic RDD-project OUTFIT
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Research and Development Strategy for Organic Agriculture and Food Systems

Preface

The transformation of the food system and consumption to be sustainable in terms of environment, health, economics, and social accountability demand a research and development strategy that is ambitious as well as holistically oriented. Organic agriculture is a holistically oriented production and food system which, given its foundation in IFOAM's four organic principles for organic agriculture[1], as well as through agroecological practices, works towards sustainability in the broadest sense of the term.

The EU Council Regulation[2] on organic production defines organic production as "... an overall system of farm management and food production that combines best environmental and climate action practices, a high level of biodiversity, the preservation of natural resources and the application of high animal welfare standards and high production standards in line with the demand of a growing number of consumers for products produced using natural substances and processes."

Organic production thus plays a dual role in society – on the one hand by supplying a specific market that meets consumers' demand for organic products - and on the other hand by providing public goods that contribute to the protection of the climate, the environment, biodiversity, animal welfare, and rural development.
In addition, the four IFOAM principles for organic agriculture[1] are closely connected to the UN's Sustainable Development Goals[3], which recognize that social, economic, and environmental development are closely linked and require integrated efforts.

This research and development strategy is based on the organic principles[1] and the EU Council Regulationon organic production[2] and it determines the priorities of ICROFS' research and development funds. The goal is research-based knowledge and technologies that support the continuous growth and development of the organic sector, and increases the credibility, sustainability, and contribution to public goods, of and from the organic sector.
The strategy is devised by ICROFS with broad involvement of primary producers, industry, organisations, research environments, and the authorities.

Jørn Jespersen
Chairman of the board
ICROFS

Jakob Sehested
Director
ICROFS

ICROFS' vision and mission

ICROFS' vision is a sustainable food system based on the organic philosophy and the organic principles.
ICROFS' mission is to coordinate, execute, and disseminate strategic and application-oriented research of high quality, which contributes to public goods and the development of a sustainable, market-driven, and competitive Danish organic sector.

[1] IFOAM - Organics International, principles for organic farming
[2] Regulation (EU) 2018/848 of the European Parliament and of the Council of 30 May 2018 on organic production and labelling of organic products
[3] THE 17 GOALS - Sustainable Development Goals

ICROFS' success criteria for research and development

The strategy targets practice-oriented solutions and research, which is carried out in close collaboration between researchers and stakeholders throughout the value chain (farmers, companies, authorities, consumers, and organisations) in order to develop innovative and competitive solutions, as well as documenting and disseminating these to stakeholders and society. This is reflected in the following four key success criteria to be promoted in the research projects:

- **SUSTAINABILITY** – the projects must contribute to sustainable production systems, which are sustainable in the broad sense of the term, including environmentally, health-wise, economically, and socially
- **INNOVATION** – the projects must contribute to innovative production and food systems that meet consumer and societal demands for organic products and public goods
- **GROWTH** – the projects must contribute to resilient, productive, and efficient production and food systems, and support continued sustainable growth in the organic production
- **CREDIBILITY** – the projects must contribute to the credibility of organic farming and food systems in relation to the basic organic principles

The four organic principles, as defined by IFOAM

- The principle of health
- The principle of ecology
- The principle of fairness
- The principle of care

Organic production is based on agroecological methods

Agroecology is the study of the interactions between plants, soil, animals, the environment, and people, inside agricultural systems. Through agroecological methods, this knowledge is transformed into sustainable agricultural practices.

ICROFS' criteria for evaluation and prioritization of research and development projects

Based on the success criteria, the Organic RDD projects are evaluated and prioritized on their excellence and impact in five areas:

- Research quality (mandatory)
- Green effects (in minimum one out of three areas)
- Dissemination and stakeholder involvement (mandatory)
- Economic effects (if relevant)
- Relevance and prospects regarding the development of organic agriculture and food systems (mandatory)

Research quality
The level of the research quality of the projects and the research qualifications of the project participants are assessed by impartial international experts.

Green effects
The projects are required to have an impact in relation to one or more of the following factors:

1. Credibility in relation to the organic principles, e.g., increasing soil fertility, sustainable use of resources, recirculation, optimization of the food system, and mild processing
2. Contributing to public goods, e.g., climate and environment, nature and biodiversity, health and welfare, energy, and rural development
3. Resilient systems, in both a biological and economical sense, and in relation to external pressures and changes, e.g., climate changes

Dissemination and stakeholder involvement
The projects must identify relevant target groups, users, and stakeholders, and plan for dissemination and stakeholder involvement, in a way that enables the results to be utilized by users in the sector and in society.

Economic effects
If relevant, the project must have an impact on at least one of the following two parameters:

1. Proceeds for one or more of the project participants
2. Economic impact in the sector or in society

These effects will not be part of the evaluation of projects, in which the results cannot be directly transformed into an economic benefit (typically projects with impacts related to public goods).

Relevance and prospects regarding the development of organic agriculture and food systems
ICROFS emphasizes the novelty value, relevance, and prospects of the projects.

ICROFS' focus areas

Through six focus areas, ICROFS' research and development strategy addresses the central challenges and potentials of organic farming and food systems:

- CIRCULAR BIOECONOMY
- CLIMATE AND ENVIRONMENT
- BIODIVERSITY
- HEALTH AND WELFARE
- THE ORGANIC CONSUMER OF THE FUTURE
- ORGANIC FARMING – FOR A LIVING

The six focus areas determine the direction of ICROFS' research and development funds in the Organic RDD programme and will be elaborated in the following pages. The need for research and development, with regard to the different focus areas, will be expanded through general topics and a list of examples under each topic.

Circular bioeconomy

Recycling and sustainable utilization of resources are key principles in organic agriculture and food systems. The planet's resources must be utilized sustainably to accommodate future generations, healthy ecosystems, healthy animal feed and healthy food for humans. Organic agricultural production and food systems should therefore be based on renewable resources and sustainable, efficient, and safe ecological cycles.

This requires that new and safe solutions and technologies are developed for organic bio-based production, reduction of food waste, and for recycling of nutrients from the industry and society to organic farmers.

Research and development needs

- Self-sufficiency in nutrients at the farm-level, e.g. by effective utilization of nitrogen-fixing crops and animal manure; development of plant-based fertilizers and soil-improving material; utilization of degassed material from biogas production; utilization of side streams from bio-refineries, and utilization of composting and composting processes.
- Safe recycling of nutrients from society and industry. This also includes the reduction of food waste and recycling of side streams and residual and waste products, such as fertilizers for crop production and nutrients for livestock production. Emphasis must be put on health and safety, such as the contents of undesirable substances, endocrine disruptors, and microorganisms, as well as quantity and availability.
- Biorefinery, fermentation, and biogasification, as well as self-sufficiency in energy at the farm-level. This includes effective utilization of relevant biological materials for the production of e.g., proteins and other nutritional components for livestock and people, energy, ingredients for the food industry, replacements of fossil-based materials, and recirculation of nutrients to the soil.
- Business and cooperation models for the circular bioeconomy, including solutions for local processing and security of supply, for recirculation of nutrients and biomass between society and organic agriculture, and between organic agricultural systems.
- Utilization of data and information and communication technologies (ICT) to support life-cycle assessments, management of production processes, as well as documentation, traceability, and product safety.

Climate and environment

The fundamental principle of organic agriculture is to mimic and work together with natural processes and ecosystems. The food system is a connected entity, which is why the negative impact on climate and environment must be minimized in a holistic approach where effects on e.g. nature and biodiversity, animal welfare and use of resources, are also included.

Organic agriculture and food systems must continue to improve on all parameters concerning climate and environment, by reducing emissions of greenhouse gasses and loss of nutrients, as well as increasing the soil carbon sequestration and protecting drinking water reservoirs and the landscape. Furthermore, organic production must be resilient to the effects of climate change.

Research and development needs

- Resilient cultivation systems and technologies for organic crop production, which increase resource use efficiency, reduce the impact on climate and environment and are adaptable to the effects of climate change. This includes for example types of crops, combinations of crops, rotation of crops and catch crops, as well as cultivation systems and technologies, which increase carbon sequestration, minimize emissions of greenhouse gases, and reduce the loss of nutrients and retain them in the root zone during winter.
- Sustainable supply of nutrients to organic livestock and aquacultures, to secure high productivity and minimal excretion of nutrients and emission of greenhouse gases. This includes, among other things, optimization of the nutrient supply to free-range animals, mineral supply from renewable resources, innovative technologies for the supply of single nutrients to organic livestock, and solutions for a high level of self-sufficiency and local processing.
- Production and management systems for organic production of livestock and aquacultures that are resilient, minimize the impact on climate and environment and are adapted to climate change. This could be animal housing systems, grazing systems, and types of livestock, which secure an efficient production, utilization of nutrients, as well as minimal emissions, without compromising the health and welfare of the animals; technologies and systems for the management of manure, which reduce the emissions of greenhouse gases and ammonia, and in general reduce the leaching of nutrients; production systems with high diversity and with combinations of plant and livestock production, and perennial crops with a high soil carbon sequestration.
- Energy-saving technology, as well as the production and usage of sustainable types of energy. This includes for example, reduced tillage, optimization and electrification of stable and field systems; biogas production using catch crops, residual products and bi-products, as well as manure and plant residues in combination with sustainable recycling of nutrients for crop production.
- Systems and technologies for the processing, packaging and transport of organic food, which minimize the impact on climate and environment per unit, by using for example sustainable materials and concepts which reduce food waste and impacts on climate and environment.
- Documentation and quantification of climate and environmental footprints, including utilization of data, ICT and modelling to support management of production processes, documentation of traceability and product safety.

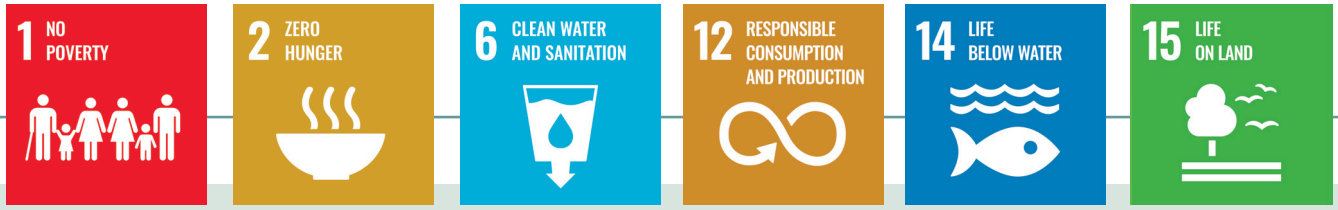
Biodiversity

It is essential for organic farming to protect nature and biodiversity. High biodiversity in the farmed areas and in small biotopes connected to the farmed area is an important part of the natural resource foundation for organic food production, e.g., in terms of pollinators and other beneficial insects, in terms of microorganisms that contribute to the maintenance of fertile soil, and in terms of birds that contribute to the regulation of pest insects.

There is a need for considering biodiversity in the evaluation and development of all new production systems and technologies, such as initiatives that improve the interplay between biodiversity and the farming landscape. The attention to biodiversity in organic agriculture will fulfil society's and consumers' demand for a diverse supply of sustainable food products and comply with the expectations of a rich landscape with habitats for insects, birds, and plants.

Research and development needs

- Plant cultivation and livestock production systems, initiatives and methods that support biodiversity in the cultivated soil, the cultivated land areas, as well as in the surrounding and connected areas. This includes an investigation of the interplay between biodiversity and soil fertility, e.g., in regenerative systems, as well as organic methods that support this.
- Cultivation systems that have a focus on functional biodiversity and the possibility to utilize the biodiversity e.g., in relation to production and quality and thereby the farmer's economy.
- Documentation and quantification of the effects of organic agriculture on nature, biodiversity, and ecological functions. This includes documentation of improved pollination and pest control, improved soil fertility, health, and structure, as well as documentation of improved resilience in the production; knowledge on how specific production systems contribute to biodiversity in the farmed landscape over time, as well as decision-support and practice-oriented recommendations tailored to the farmer's needs.
- Value assessment of the effects of organic agriculture on biodiversity as a public good, which can form the basis for payment and relevant rules for the establishment of organic systems and form the basis for initiatives that sustain biodiversity in the farmed areas and landscapes.



Health and welfare

In organic farming, health is viewed holistically as an interconnection between soil, crops, animals, and humans (One Health[4]). There is a need to develop organic production systems and technologies that support soil fertility and health, as well as resilient and healthy plants, livestock, and fish. Simultaneously, there is a need to put focus on the health and nutritional value of food products, including plant-based food products. Finally, there must be a focus on animal welfare and the fulfilment of behavioural needs, including access to outdoor areas and grazing.

Research and development needs

- Healthy soil. This includes, among other things, organic soil tillage and production systems and technologies, that preserve and improve the soil fertility, health, resilience, and carbon sequestration of the soil, including interactions between beneficial and harmful microorganisms, as well as between microorganisms and plants; breakdown of unwanted substances for example in connection with recirculation of nutrients from society and companies; development of natural soil improvers e.g. based on crops, seaweed and algae, and products from biogas and fermented materials.

- Healthy plants. This includes organic cultivation and production systems, which support and improve health and resilience in plants and plant-based foods, such as cultivation systems, breeding strategies and varieties which are tailored to organic production with a focus on disease resistance and tolerance, the quality of food products, and adaptation to local soil and climate conditions, and prevention and control of diseases, pests, and weeds.

- Healthy livestock with a high degree of welfare. This includes organic production systems and technologies, which encourage that resilient animals and fish are integrated into a sustainable food system, that supplies healthy food products; prevention and reduction of diseases and mortality, and reduced usage of antibiotics; breeding strategies and species which are tailored to organic production, with consideration to specific needs for disease resistance, food quality, and adaptation to local conditions. Finally, there is a need to focus on barn systems and outdoor systems, as well as feed items and feeding methods, which support the natural behaviour and welfare of the animals, without compromising the climate and environmental impacts of the production, or the health of the animals.

- The nutritional value and health aspects of the food products. This includes the role and potential of the organic sector, to promote health in the population, e.g. through plant-based foods, and by highlighting the importance of health in relation to the consumers' choice of organic foods, as well as the significance of minimal exposure to pesticides and additives.

- Utilization of data, ICT, and modelling to support the management of production processes and documentation e.g., of health, animal welfare, traceability, product safety, and life cycle assessments.

[4]: One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent (OHHLEP One Health definition, 2021).

The organic consumer of the future

Organic farming must meet the consumer demands for healthy and tasty high-quality food products. This is reflected in the consumers' increased focus on diet composition, in relation to nutrition and health, which includes the amount of plant-based foods. Simultaneously, it is of growing importance to consumers, to know the origin, climate impact, and sustainability of the food products.

Knowledge about and dialogue with a variety of consumers, regarding their demands and expectations for organic production and organic products, is crucial for the organic food systems' ability to meet the expectations for the quality of the products. This is also important regarding the consumers' confidence in relation to the contribution of organic farming to public goods, such as animal welfare, nature and biodiversity, climate, environment, and clean drinking water.

Research and development needs

- Food culture, and the behavior, values, and preferences of different types of consumers, e.g. regarding consumption patterns, decision to buy organic products, perception of quality parameters, distribution channels, willingness to buy and pay for organic products, diet composition, and the need for experience-based communication and distribution channels.

- The consumer's perception of, and response to, conflicting concerns in organic production. Examples could be between animal welfare, through access to outdoor areas, and the risk of increased environmental impact from outdoor animals; between the climate impact from livestock production and the importance of livestock for plant production and biodiversity; between the need for recirculation of nutrients from society to sustainable organic production and the risk of supplying unwanted substances through wastewater and waste.

- Trustworthy communication and marketing of the added value of organic food production. Examples could be how communication about the specific qualities of organic products and the contribution of organic products to public goods influence the consumers' perception of the credibility, image, and reputation of Danish organic production.

- The consumers' perception of geographical qualities at local, national, and international levels. This includes for example the consumers' buying behavior and perception of local food production and short supply chains, as well as foreign consumers' perception of Denmark as a brand for organic food and as a gastronomy destination.

- Methods to strengthen collaboration, networking, product development, and knowledge exchange across e.g., production, retail, catering, restaurants, and consumers, in relation to the development of new sustainable production concepts and food supply in an organic context.

Organic farming – for a living

Organic farming must be an attractive profession both in terms of profitability, development opportunities and working conditions, and in terms of attracting new generations of organic farmers. The development of organic methods should be made to create a sector that is sustainable and valuable for the farmer as well as society and takes social issues into account. Consumers and society have increasingly high demands for the sustainability of food production, and the quality of the products, however, at the same time, unstable and extreme climate-related production conditions create challenges for management and the economy. Society's increased focus on the local supply of food creates opportunities for organic farmers and aquaculture companies, for example in terms of higher crop diversity, new products, product development and local processing.

Research and development needs

- Multifunctional production systems that include multiple productions and production methods in order to create resilience, adaptation to effects of climate change, economic stability, and a bigger diversity in production. This can for example be done through intercropping and a higher level of integration between livestock and crop production; different types of agroforestry; a higher level of integration of primary production in the value chain and product development, and solutions for local processing and security of supply. This includes the opportunity for increased inclusion of local populations and integration of new dimensions in the farming systems, such as ecotourism and social activities.
- Management systems and technological solutions for new ways of cooperation, integrated types of farming, management collaborations, alternative types of ownership, and organization of the farming production adapted to the organic management style. Furthermore, this includes business models that support synergies between specialized production in integrated systems within the farm, between farms, and between farms and society.
- Decision-making tools in relation to management and production economy, to support efficiency and profitability in relation to the specific challenges and possibilities of the organic sector. This includes the need for expertise within multiple production areas, utilizing synergies and coordination between the multiple production areas within the farm, adoption of systems that improve climate change mitigation and sustainability, and a higher demand for locally produced food. Furthermore, this includes challenges and possibilities connected with new forms of management, cooperation, and ownership, new business models and production systems that create a higher diversity in the farmed landscape and a better connection between rural areas and areas with cities.

About ICROFS

International Centre for Research in Organic Food Systems (ICROFS) has existed since 1996. The center is appointed and financially supported by the Ministry of Food, Agriculture and Fisheries of Denmark. ICROFS contributes to further development of a market-driven and competitive organic sector and thereby supports a continuous growth in the Danish organic sector. ICROFS is located at Aarhus University in Foulum, Viborg, and has its own national board and own statues. The center supports organic research projects from many different institutions and industries.

It is ICROFS' goal to support the development of organic farming and food production systems through research-based knowledge. ICROFS is a center "without walls" that coordinates, disseminates, and promotes research, while the actual research is carried out by different research institutions. The EU Council Regulation on organic production and IFOAM's organic principles create the foundation and guidelines of ICROFS' activities.

ICROFS coordinates the Danish research programme on organic farming and food production systems (Organic RDD), and the European research network, CORE Organic. The Danish programme as well as the international cooperation, secure Denmark in a strong position as a front figure for organic research – benefiting the development of the Danish organic sector. ICROFS' secretariat also participates, either individually or as an entity, in externally financed research and networking projects. In such projects, ICROFS will often assume a role concerning coordination and execution application, communication, dissemination of research results, and involvement of farmers, advisors, and companies.

ICROFS' board represents primary producers, the industry, the consumers and researchers, and determines the vision and goals of ICROFS' work.

The project participants often come from:

- Universities
- The primary production
- Consultancy companies
- The private industry
- Public institutions

ICROFS' research activities support sustainable organic farming and sustainable food production systems that fulfill the demands of the consumers, secure the development of productivity, and contribute to society in areas such as climate and environment, nature and biodiversity, protection of drinking water, animal welfare, health, and development of rural areas.

ICROFS involves stakeholders and users in the research, which helps to secure a strong connection between new knowledge and its implementation. An important task for ICROFS is the dissemination and communication of the new knowledge from research to the users, other stakeholders, and society in general.

Research dissemination
ICROFS is very active in relation to the dissemination of research and knowledge from the Organic RDD and the CORE Organic projects. ICROFS supports communication and dissemination from the beginning of the projects, among others through digital platforms and social media – but also through scientific papers, popular science channels and the daily press.

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